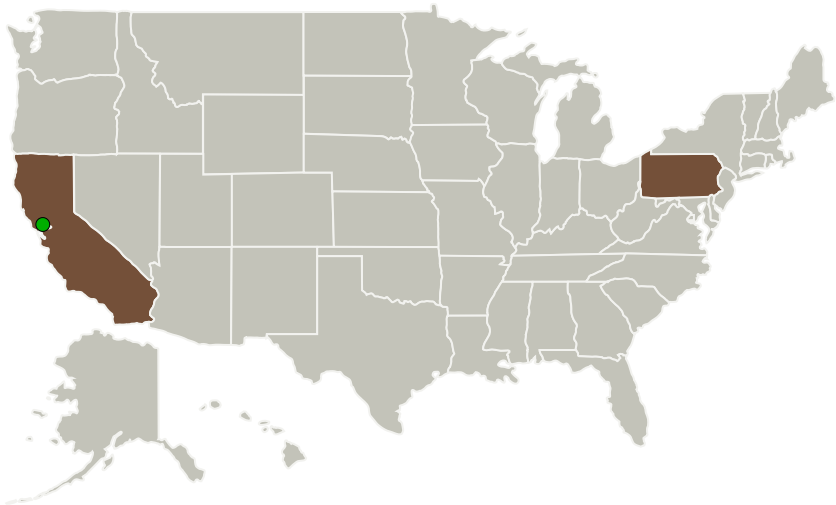
Interfacial Design of Composite Ablative Materials, Phase II

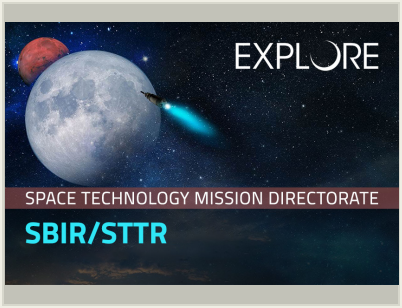
Completed Technology Project (2011 - 2013)

Project Introduction

This Small Business Innovation Research (SBIR) project proposes the development of a computational software package to provide NASA with advanced materials development capabilities for existing and new ablative materials used in the next generation thermal protection systems (TPS) of space vehicles. This materials development software package (MDSAM) can be used to optimize properties (high strength and low thermal conductivity) for both the virgin material as well as the char that forms during the operating conditions. It will provide atomistic-level information on char evolution and the degradation of thermo-mechanical properties. The proposed MDSAM will consist of the following two modules: (i) an experimentally validated, atomistic-level simulation engine capable of predicting the role of interfacial structure on the resin-to-carbon process and (ii) atomistically-informed continuum-level thermo-mechanical performance analyzer for composite ablative materials subjected to transient pyrolytic conditions. The underlying methodology and the software package will be transitioned to NASA scientists working on ablative materials development. In addition to developing a computational software package, we will address open, unsolved problems in the literature to support NASA's ablative materials development requirements. In the course of developing this methodology, we will produce significant scientific results on pyrolysis and materials properties that will be important to NASA.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Advanced Cooling Technologies, Inc.	Lead Organization	Industry	Lancaster, Pennsylvania
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Pennsylvania

Project Transitions

June 2011: Project Start

August 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139018)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Cooling Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Tapan G Desai

Co-Investigator:

Tapan Desai

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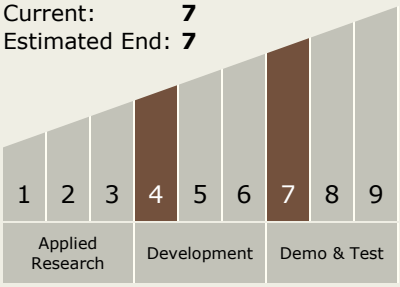
Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System